

**Math 115**

**Fall 2017**

**Lecture 23**



## Solving Polynomial Equations:

Zero-Product Rule or Zero-Factor Thm

**If  $A \cdot B = 0$ , then**

**$A = 0$  or  $B = 0$**

**(Maybe both)**

Solve  $(x-3)(x+7)=0$

By Zero-factor Property,

$$x-3=0 \quad \text{or} \quad x+7=0$$

$$\boxed{x=3}$$

or

$$\boxed{x=-7}$$

$$\{-7, 3\}$$

Solve  $(2x+5)(4x-9)(x-10)=0$

By Z.F.P.,  $2x+5=0$ ,  $4x-9=0$ , or  $x-10=0$

$$2x = -5$$

$$\boxed{x = -\frac{5}{2}}$$

$$4x = 9$$

$$\boxed{x = \frac{9}{4}}$$

$$\boxed{x=10}$$

$$\left\{-\frac{5}{2}, \frac{9}{4}, 10\right\}$$

Things to look for:

RHS = 0

LHS = completely  
factored

Use Zero-Factor Prop. to Solve:

$$1) (x-4)(x+1)=0$$

$$x-4=0 \quad \text{or} \quad x+1=0$$

$$\boxed{x=4}$$

$$\boxed{x=-1}$$

$$\{-1, 4\}$$

$$2) (8x+3)(3x-8)=0$$

$$8x+3=0 \quad \text{or} \quad 3x-8=0$$

$$8x=-3$$

$$3x=8$$

$$\boxed{x=-\frac{3}{8}}$$

$$\boxed{x=\frac{8}{3}}$$

$$\left\{-\frac{3}{8}, \frac{8}{3}\right\}$$

To Solve a Polynomial eqn:

1) Make RHS = 0

2) Factor LHS Completely.

3) Use Zero-Factor Property to Solve

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$$\text{Solve} \quad x^2 - 2x - 24 = 0$$

$$(x-6)(x+4)=0$$

$$\text{by Z.F.P.} \Rightarrow x-6=0 \quad \text{or} \quad x+4=0$$

$$\boxed{x=6}$$

$$\boxed{x=-4}$$

$$\{-4, 6\}$$

Solve  $x^2 - 13x = -36$

RHS=0  $\Rightarrow x^2 - 13x + 36 = 0$

LHS must be factored completely  $\Rightarrow (x - 9)(x - 4) = 0$

Now use Z.F.P.  $\Rightarrow x - 9 = 0$  or  $x - 4 = 0$

$x = 9$

$x = 4$

$\{4, 9\}$

Solve  $2x^2 - 5 = 3x$

① Make RHS zero

$2x^2 - 5 - 3x = 0$

② Factor LHS completely

$2x^2 - 3x - 5 = 0$

$(2x - 5)(x + 1) = 0$

③ Use Z.F.P., and Solve

$2x - 5 = 0$  or  $x + 1 = 0$

$2x = 5$

$x = -1$

$x = 5/2$

$\{-1, 5/2\}$

Solve  $4x^2 = 7 - 3x$

① Make RHS Zero.

$$4x^2 - 7 + 3x = 0$$

② Factor LHS completely

$$4x^2 + 3x - 7 = 0$$

$$(4x + 7)(x - 1) = 0$$

③ Now use Zero-factor Thm to solve

$$4x + 7 = 0 \quad \text{or} \quad x - 1 = 0$$

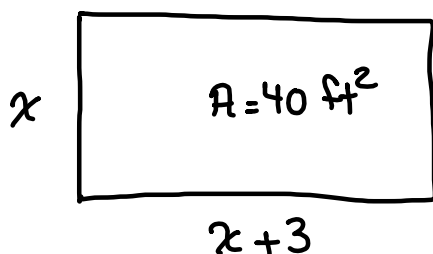
$$4x = -7$$

$$x = -\frac{7}{4}$$

$$x = 1$$

$$\left\{-\frac{7}{4}, 1\right\}$$

find  $x$ :



Rectangle

$$A = LW$$

So

$$x(x+3) = 40$$

① Distribute, Simplify, and make RHS zero.

$$x^2 + 3x = 40$$

$$x^2 + 3x - 40 = 0$$

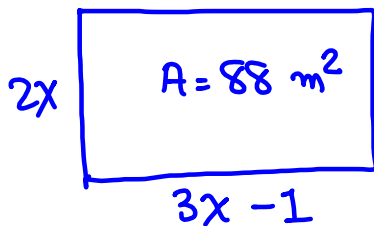
② factor LHS completely

$$(x + 8)(x - 5) = 0$$

③ Use Z.F.P.,  $x + 8 = 0$   
 $x - 5 = 0$

~~$$x = -8$$~~

$$x = 5$$

find  $x$ :

Rectangle

$$A = LW$$

$$2x(3x-1) = 88$$

$$6x^2 - 2x - 88 = 0$$

Divide by 2 to reduce

$$3x^2 - x - 44 = 0 \quad \rightarrow P = -132 \quad \& \quad S = -1$$

$-12 \quad \& \quad 11$

$$(x-4)(3x+11) = 0 \quad \underline{3x^2 - 12x + 11x - 44 = 0}$$

Now use Z.F.P. to Solve  $\left\{ \begin{array}{l} 3x(x-4) + 11(x-4) = 0 \end{array} \right.$

$$x-4=0$$

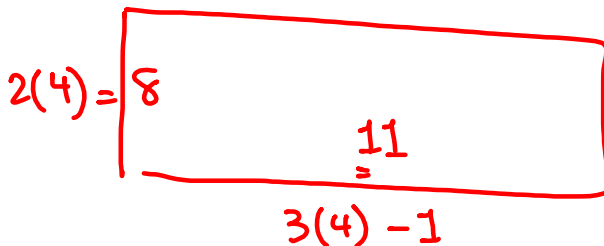
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$$3x+11=0$$

$$\boxed{x=4}$$

$$3x = -11$$

~~$$x = -\frac{11}{3}$$~~



$$A = LW$$

$$= 11 \cdot 8$$

$$= 88$$

Solve  $x^2 - 36 = 0$

$$(x+6)(x-6) = 0$$

by Z.F.P.  $x+6=0$  or  $x-6=0$

$$\boxed{x = -6}$$

$$\boxed{x = 6}$$

$$\{-6, 6\} \quad \text{or} \quad \{\pm 6\}$$